Claims

WHAT IS CLAIMED IS:

1. A method of analyzing a measurable distribution having random components and deterministic components, comprising the steps of:

(a) collecting data from a data source;

(b) constructing a probability density function based on the data such that the probability density function defines a distribution, wherein the probability density function is a convolution of deterministic functions and random functions;

(c) construct a probability density function based on a convolution model having three or more parameters wherein at least one of the parameters are unknown, the convolution model having a deterministic model and a random model;

(d) determining unknown parameters by using a deconvolution process.

2. The method of claim 1, wherein the deterministic model has a deterministic parameter and the random model has two or more random parameters.

3. The method of claim 2, wherein the deterministic parameter is time location.

4. The method of claim 1, wherein the deterministic model has at least one time location parameter and at least one magnitude parameter.

5. The method of claim 1, wherein the determining step comprises the steps of:
formulating an inverse problem; and
solving the inverse problem to extract the parameters.

6. The method of claim 5, wherein the inverse problem is solved via a recursive solution.

7. The method of claim 5, wherein the inverse problem is solved via an optimizer based solution.

8. The method of claim 1, wherein the distribution is a signal distribution.

9. The method of claim 1, wherein all of the parameters are unknown.

10. The method of claim 1, wherein at least one random model parameter is known, wherein the determining step further comprises the step of:

determining a deterministic model parameter based on the known random model parameter by using a deconvolution process.

11. The method of claim 10, wherein the deterministic model has a deterministic parameter and the random model has two or more random parameters.

12. The method of claim 11, wherein the deterministic parameter is time location.

13. The method of claim 10, wherein the deterministic model has a time location parameter and a magnitude parameter.

14. The method of claim 10, wherein the determining step comprises the steps of:

formulating an inverse problem; and

solving the inverse problem to extract the parameters.

15. The method of claim 14, wherein the inverse problem is solved via a recursive solution.

16. The method of claim 14, wherein the inverse problem is solved via an optimizer solution.

17. The method of claim 10, wherein the distribution is a signal distribution.

18. The method of claim 10, wherein all of the random parameters are known.

19. The method of claim 18, wherein the determining step comprises the steps of:
formulating an inverse problem; and
solving the inverse problem to extract the parameters.

20. The method of claim 19, wherein the inverse problem is solved via a closed solution.

21. The method of claim 1, wherein at least one deterministic model parameter is known, wherein the determining step further comprises the step of:

determining the random model parameter based on known deterministic model parameters by using a deconvolution process.

22. The method of claim 21, wherein the deterministic model has a deterministic parameter and the random model has two or more random parameters.

23. The method of claim 22, wherein the deterministic parameter is time location.

24. The method of claim 21, wherein the deterministic model has a time location parameter and a magnitude parameter.

25. The method of claim 21, wherein the determining step comprises the steps of:
formulating an inverse problem; and
solving the inverse problem to extract the parameters.

26. The method of claim 25, wherein the inverse problem is solved via a recursive solution.

27. The method of claim 25, wherein the inverse problem is solved via an optimizer solution.

28. The method of claim 21, wherein the distribution is a signal distribution.

29. The method of claim 21, wherein all of the deterministic parameters are known.

30. The method of claim 29, wherein the determining step comprises the steps of:
formulating an inverse problem; and
solving the inverse problem to extract the parameters.

31. The method of claim 30, wherein the inverse problem is solved via a closed solution.

32. An apparatus for analyzing a distribution having random components and deterministic components, the apparatus comprising:

(a) a measurement apparatus for collecting data;

(b) an analyzing unit, operatively connected to the measurement apparatus, for collecting data from the measurement apparatus, for constructing a probability density function based on the data such that the probability density function defines a distribution, wherein the probability density function is a convolution of deterministic functions and random functions; construct a probability density function based on a convolution model having three or more parameters wherein at least one of the parameters are unknown, the convolution model having a deterministic model and a random model; and determining unknown parameters by using a deconvolution process.

33. The apparatus of claim 32, wherein the deterministic model has a deterministic parameter and the random model has two or more random parameters.

34. The apparatus of claim 33, wherein the deterministic parameter is time location.

35. The apparatus of claim 32, wherein the deterministic model has at least one time location parameter and at least one magnitude parameter.

36. The apparatus of claim 32, wherein the analyzing unit formulates an inverse problem and solves the inverse problem to extract the parameters.

37. The apparatus of claim 36, wherein the inverse problem is solved via a recursive solution.

38. The apparatus of claim 36, wherein the inverse problem is solved via an optimizer based solution.

39. The apparatus of claim 32, wherein the distribution is a signal distribution.

40. The apparatus of claim 32, wherein all of the parameters are unknown.

41. The apparatus of claim 32, wherein at least one random model parameter is known, wherein the analyzing unit determines a deterministic model parameter based on the known random model parameter by using a deconvolution process.

42. The apparatus of claim 41, wherein the deterministic model has a deterministic parameter and the random model has two or more random parameters.

43. The apparatus of claim 42, wherein the deterministic parameter is time location.

44. The apparatus of claim 41, wherein the deterministic model has a time location parameter and a magnitude parameter.

45. The apparatus of claim 41, wherein the analyzing unit formulates an inverse problem; and solves the inverse problem to extract the parameters.

46. The apparatus of claim 45, wherein the inverse problem is solved via a recursive solution.

47. The apparatus of claim 45, wherein the inverse problem is solved via an optimizer solution.

48. The apparatus of claim 41, wherein the distribution is a signal distribution.

49. The apparatus of claim 41, wherein all of the random parameters are known.

50. The apparatus of claim 49, wherein the analyzing unit formulates an inverse problem and solves the inverse problem to extract the parameters.

51. The apparatus of claim 50, wherein the inverse problem is solved via a closed solution.

52. The apparatus of claim 53, wherein at least one deterministic model parameter is known, wherein the analyzing unit determines the random model parameter based on known deterministic model parameters by using a deconvolution process.

53. The apparatus of claim 52, wherein the deterministic model has a deterministic parameter and the random model has two or more random parameters.

54. The apparatus of claim 53, wherein the deterministic parameter is time location.

55. The apparatus of claim 52, wherein the deterministic model has a time location parameter and a magnitude parameter.

56. The apparatus of claim 52, wherein the analyzing unit formulates an inverse problem and solves the inverse problem to extract the parameters.

57. The apparatus of claim 56, wherein the inverse problem is solved via a recursive solution.

58. The apparatus of claim 56, wherein the inverse problem is solved via an optimizer solution.

59. The apparatus of claim 53, wherein the distribution is a signal distribution.

60. The apparatus of claim 53, wherein all of the deterministic parameters are known.

61. The apparatus of claim 60, wherein the analyzing unit formulates an inverse problem and solves the inverse problem to extract the parameters.

62. The apparatus of claim 61, wherein the inverse problem is solved via a closed solution.

63. An article of manufacture comprising a program storage medium readable by a computer having a memory, the medium tangibly embodying one or more programs of instructions executable by the computer to perform method steps for analyzing a distribution having random components and deterministic components, the method comprising the steps of:

(a) collecting data from a data source;

(b) constructing a probability density function based on the data such that the probability density function defines a distribution, wherein the probability density function is a convolution of deterministic functions and random functions;

(c) construct a probability density function based on a convolution model having three or more parameters wherein at least one of the parameters are unknown, the convolution model having a deterministic model and a random model;

(d) determining unknown parameters by using a deconvolution process.

64. The method of claim 63, wherein the deterministic model has a deterministic parameter and the random model has two or more random parameters.

65. The method of claim 64, wherein the deterministic parameter is time location.

66. The method of claim 63, wherein the deterministic model has at least one time location parameter and at least one magnitude parameter.

67. The method of claim 63, wherein the determining step comprises the steps of:

formulating an inverse problem; and

solving the inverse problem to extract the parameters.

68. The method of claim 67, wherein the inverse problem is solved via a recursive solution.

69. The method of claim 67, wherein the inverse problem is solved via an optimizer based solution.

70. The method of claim 63, wherein the distribution is a signal distribution.

71. The method of claim 63, wherein all of the parameters are unknown.

72. The method of claim 63, wherein at least one random model parameter is known, wherein the determining step further comprises the step of:

determining a deterministic model parameter based on the known random model parameter by using a deconvolution process.

73. The method of claim 72, wherein the deterministic model has a deterministic parameter and the random model has two or more random parameters.

74. The method of claim 73, wherein the deterministic parameter is time location.

75. The method of claim 72, wherein the deterministic model has a time location parameter and a magnitude parameter.

76. The method of claim 72, wherein the determining step comprises the steps of:

formulating an inverse problem; and

solving the inverse problem to extract the parameters.

77. The method of claim 76, wherein the inverse problem is solved via a recursive solution.

78. The method of claim 76, wherein the inverse problem is solved via an optimizer solution.

79. The method of claim 72, wherein the distribution is a signal distribution.

80. The method of claim 72, wherein all of the random parameters are known.

81. The method of claim 80, wherein the determining step comprises the steps of:
formulating an inverse problem; and
solving the inverse problem to extract the parameters.

82. The method of claim 81, wherein the inverse problem is solved via a closed solution.

83. The method of claim 63, wherein at least one deterministic model parameter is known, wherein the determining step further comprises the step of:

determining the random model parameter based on known deterministic model parameters by using a deconvolution process.

84. The method of claim 83, wherein the deterministic model has a deterministic parameter and the random model has two or more random parameters.

85. The method of claim 84, wherein the deterministic parameter is time location.

86. The method of claim 83, wherein the deterministic model has a time location parameter and a magnitude parameter.

87. The method of claim 83, wherein the determining step comprises the steps of:
formulating an inverse problem; and
solving the inverse problem to extract the parameters.

88. The method of claim 87, wherein the inverse problem is solved via a recursive solution.

89. The method of claim 87, wherein the inverse problem is solved via an optimizer solution.

90. The method of claim 83, wherein the distribution is a signal distribution.

91. The method of claim 83, wherein all of the deterministic parameters are known.

92. The method of claim 91, wherein the determining step comprises the steps of:
formulating an inverse problem; and
solving the inverse problem to extract the parameters.

93. The method of claim 92, wherein the inverse problem is solved via a closed solution.